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## **Rear Air Conditioning**

**Model: E66**

**Production: Start of Production MY 2003**

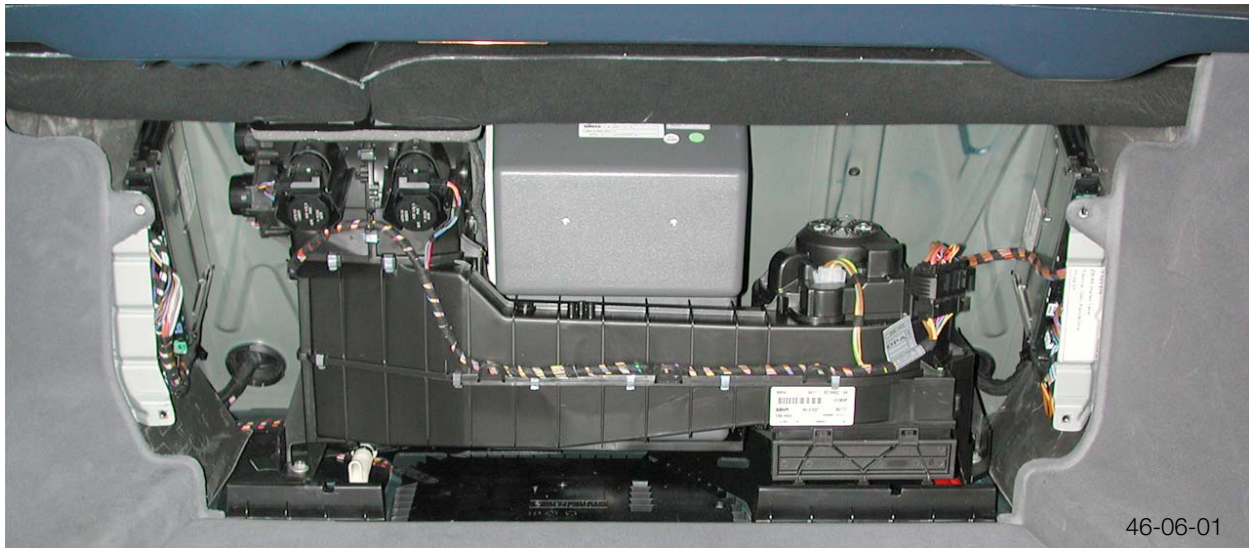
### **Objectives:**

After completion of this module you should be able to:

- Identify the components and locations of the Rear Air Conditioning System
- Explain the operation of the FKA
- Diagnosis error conditions in the FKA

## Purpose of the System

From E66 series launch, a **Rear Compartment Air Conditioning system (FKA)** may be installed as an option. The rear compartment air conditioner is located in the front area of the luggage compartment and consequently reduces the volume of the luggage compartment by about 20 percent (incl. trim panels).



The control and integration of the rear compartment air conditioning system in the IHKA refrigerant circuit is designed so that independent operation is possible for either the front or rear unit.

The air required for rear compartment air conditioning is drawn in via a particle filter (recirculated air filter) from the luggage compartment.

The rear compartment air conditioning system additionally supplies cold air to an integrated refrigerator box. This refrigerator box should not be confused with the electrically operated refrigerator box that is optionally available also for the E65.

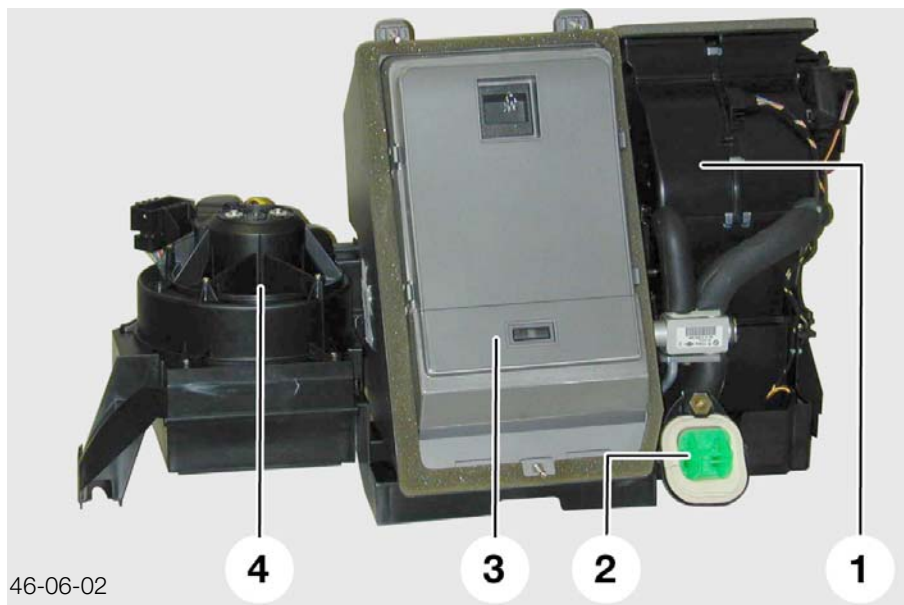
The rear air conditioning system performs the following functions:

- Regulates air volume distributed through rear ducts.
- Temperature and air volume control for left and right rear occupants.
- Air conditioning (cooling).
- Electronic control of rear evaporator temperature.
- Operation of integrated rear compartment refrigerator box.

## System Components

The rear air conditioning system consists of the following components:

- Evaporator Housing with Actuators and Flaps
- Refrigerant Circuit
  - Evaporator and Expansion Valve
  - Refrigerant Cut-Off Valve
  - Connection point for refrigerant lines
- Refrigerator Box
- Blower and Blower Control Module
- Recirculating Air Filter
- Evaporator Temperature Sensor
- Control Panel with Electronics
- Rear Air Conditioning Duct Work
- Wiring Harness with Connector



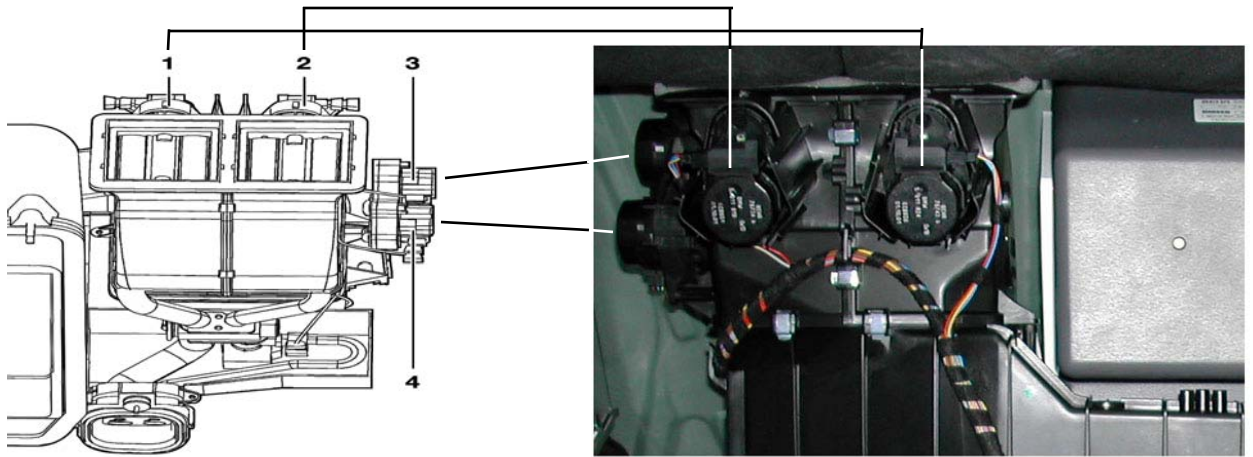
1. Evaporator Housing with Actuators and Flaps.
2. Connection Point for Refrigerant Lines.
3. Refrigerator Box
4. Blower, Blower output Final Stage and Recirculating Air Filter.

### Evaporator Housing with Actuators and Flaps

The air is distributed and mixed by means of 4 flaps and stepper motors in the rear air conditioning unit.

### Stepper motor control

The 2 stratification and ventilation flaps in each system are adjusted by means of 4 bipolar stepper motors. The stepper motors are connected by means of a step-down gear mechanism in order to ensure the required flap torque. The connection is made up of a three-wire ribbon cable connection to which all stepper motors are connected in parallel.



**View from front**

**Stepper Motors for Air and Stratification Flaps**

**View from trunk**

1. Drive for air flap, R/S air volume.
2. Drive for air flap, L/S air volume.
3. Drive for R/S stratification flap.
4. Drive for L/S stratification flap.

The three bus lines carry the supply voltage, ground and serial data information. An address is assigned for each of the individual stepper motors for individualization purposes. Each programmed address can be written only one single time and can then no longer be deleted or changed.

Each stepper motor is a controlled unit. It monitors all data on the bus, however, it accepts and answers only if its own address is recognized and no fault has occurred in the transmission of the message

Only the stepper motor with the written address matching the "monitored" address accepts, after checking, the content of the message, executes the received command and generates a status message as a response that is sent back to the control unit.

**Actuation reliability**

Different torques result for the 4 stepper motors as the result of changes in the system voltage. While the motor is activated with low-noise sine mode at voltages  $V (B+TERM30) > 11 V$ , the drive mode changes over to full step mode at lower voltages.

**Changeover of drive mode:**

$V (B+TERM30) < 9.0 V$	Motor stops
$V (B+TERM30) > 9.0 V$ and $< 10.0 V$	Motor runs at 140 Hz and in full step mode
$V (B+TERM30) > 10.0 V$ and $< 11.0 V$	Motor runs at rated frequency and in full step mode
$V (B+TERM30) > 11.0 V$ and $< 16.0 V$	Motor runs at rated frequency and in sine mode
$V (B+TERM30) > 16.0 V$	Motor stops (due to power loss in the drive IC)

These conditions also apply to the calibration run!

---

## Calibration run

None of the stepper motors features an actual position detection function, i.e. they always move relative to a reference point. One of the flap end positions (0 or 100% serves as the reference point).

The flaps assume an end position after replacing the control unit or in the event of interruptions in the voltage supply during normal operation. The end position is selected such that the subsequent set position can be reached over the shortest distance (position optimization). If calibration of the stepper motors is necessary due to voltage failure, the bit generated for this purpose is processed by the control unit itself.

Optimization of the motor running times is achieved by incorporating the set positions: If the flap is open following calibration, the calibration run is also conducted in "open" direction.

Position optimization therefore takes place based on the following criteria:

Position optimization during calibration:

Setpoint > 50%: calibration in OPEN direction

Setpoint < 50%: calibration in CLOSED direction

## Position run

The flaps assume certain positions after turning off the engine (terminal 15 de-energized). The ventilation flaps are closed and the stratification flaps are moved to the mid-position.

## Adjustment angle, number of steps and adjustment time Ventilation flap left/right

Adjustment angle: 100 degrees

Number of steps: per 15 degrees = 300 steps (at 100 degrees = 2000 steps)

Adjustment time: CLOSED <-> OPEN approx. 10 seconds

## Stratification flap left/right

Adjustment angle: 109 degrees

Number of steps: per 15 degrees = 300 steps (at 109 degrees = 2180 steps)

Adjustment time: CLOSED <-> OPEN approx. 11 seconds

**Note: The calibration run can also be triggered by the diagnosis tester.**

## Flaps/flap kinematics

### Flap positions

The programs for positioning the flaps are only active when Terminal 15 is active.

## Rear compartment refrigerator box operation

(rear compartment air conditioning left/right OFF)

- Ventilation flaps: 0%
- Stratification flaps: 50%

## MAX-AC

- Ventilation flaps: 100%
- Stratification flaps: cold

### Manual settings

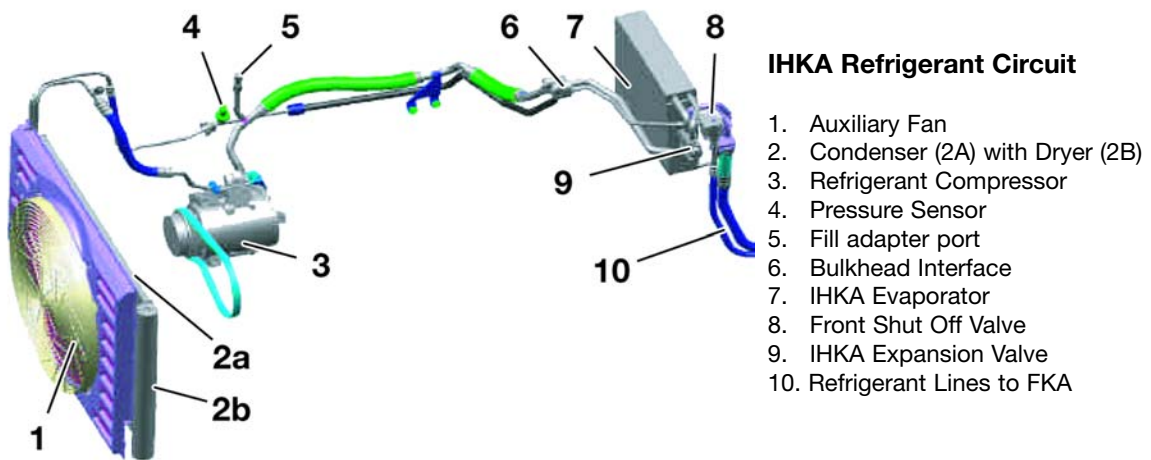
The setting of the ventilation flap is dependent on the blower status on the left and right side. The flap is opened to 100% on the side with the largest blower share.

Restriction of the ventilation flap on the side with the smaller blower share is determined in accordance with the following characteristic curve:

This theoretically determined flap opening function still needs to be corrected by the device-dependent flap characteristic curve illustrated in the following. Consequently, the actual flap opening is determined individually for each side, corresponding to the required volume of air.

The flap correction characteristic curve is the same for both sides.

### Refrigerant Circuit



The rear compartment air conditioning system (FKA) is connected to the refrigerant circuit of the IHKA. The two circuits are isolated by means of two shut-off valves that are fitted only in connection with the rear compartment air conditioning system. The shut-off valves are fitted in the pressure line ahead of the respective expansion valves of IHKA and FKA.

Two shutoff valves provide the separation between the two refrigerant circuits.

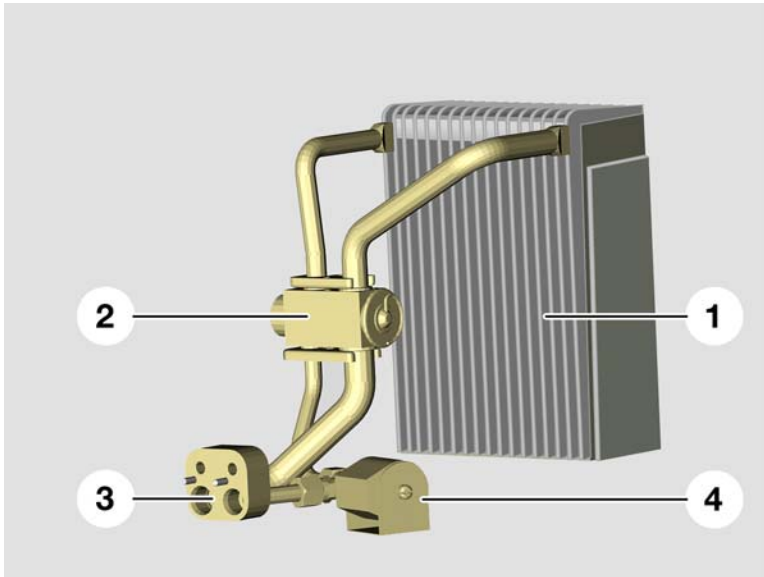
The front shut-off valve blocks off the refrigerant circuit with respect to the front evaporator (IHKA). The rear shut-off valve blocks off the refrigerant circuit with respect to the rear evaporator (FKA).



When both systems are in operation, the output of both systems can be controlled independently by means of corresponding cyclic timing of the valves. At least one valve, however, must always be opened.

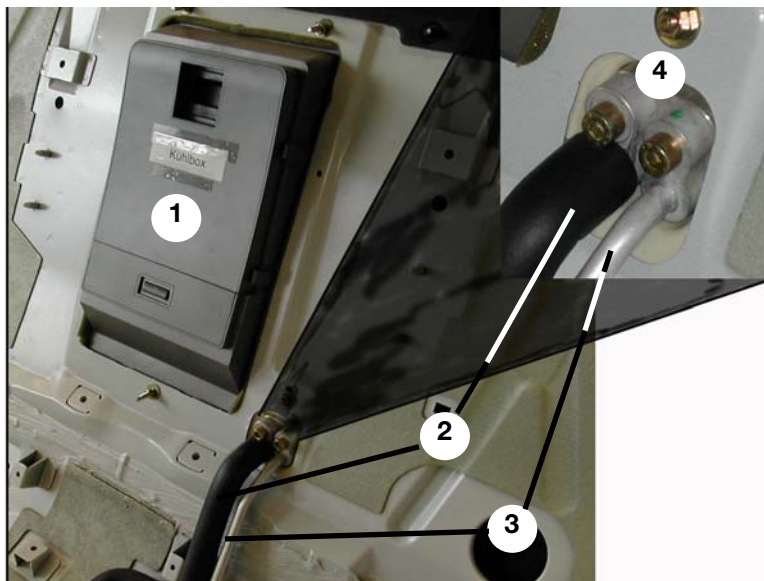
The compressor output depends on the system with the higher refrigerant requirement. The system with the lower refrigerant requirement is switched cyclically. Both systems are switched cyclically by the shut-off valves in partial load mode. The compressor runs continuously at low output. Both valves are opened and the compressor runs at maximum output at full load.

Both shut-off valves (front in the IHKA and rear in the FKA) are activated by the FKA and are closed when no power is applied. If a rear compartment air conditioning system is installed, the IHKA must be coded to "FKA installed." Otherwise, the shut-off valves will remain closed and non-operative. Damage may even be incurred!



#### Rear Evaporator and Expansion Valve

1. Evaporator
2. Expansion Valve
3. Connection for Refrigerant Lines
4. Rear Shut Off Valve



1. Rear Refrigerator
2. Refrigerant Pressure Line to FKA
3. Refrigerant Suction Line from FKA
4. FKA Line connections



## Refrigerant Capacity

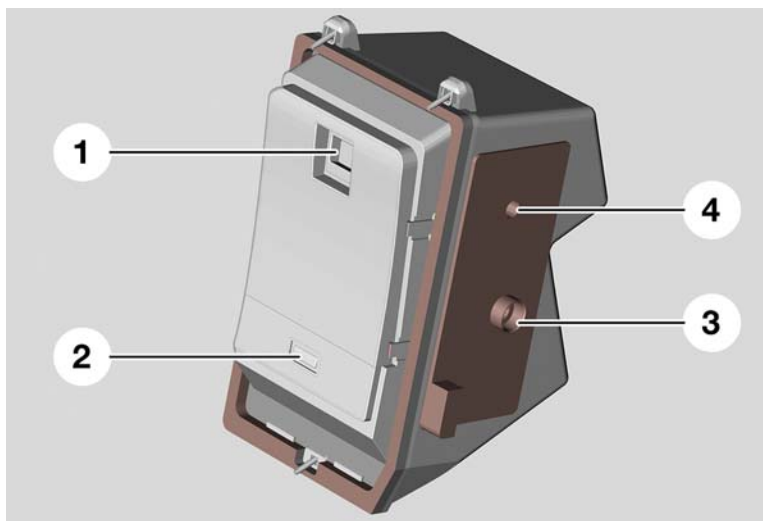
Vehicles equipped with FKA have an increase in the refrigerant capacity of 310 grams and increase in the refrigerant oil capacity of 60 grams.

## Refrigerator Box

The rear compartment refrigerator box is located behind the center armrest of the rest seats. From here, the rear compartment refrigerator box can be conveniently opened and switched on.

Cooled air from the rear compartment air conditioning system flows through the rear compartment refrigerator box. The air is then directed into the luggage compartment.

Cooled air from the rear compartment air conditioning system flows through the rear compartment refrigerator box while the engine is running.



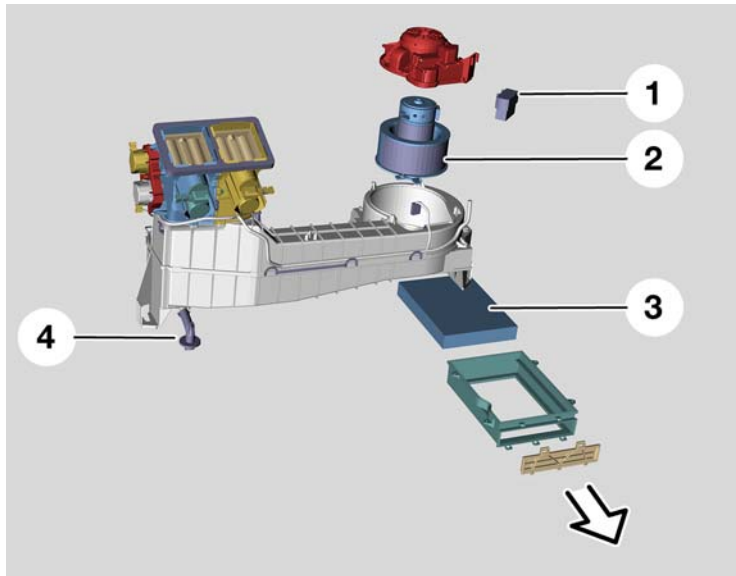
1. Grip to open refrigerator box.
2. push button switch w/Blue LED.
3. Cooling air inlet.
4. Air outlet into luggage compartment.

To maintain operation of the rear compartment refrigerator box when the rear compartment air conditioning system is switched off (left and right OFF), only the ventilation flaps are closed and the entire cooling air is made available for the rear compartment refrigerator box. In this case, the blower operates at a fixed setting (EEPROM value).

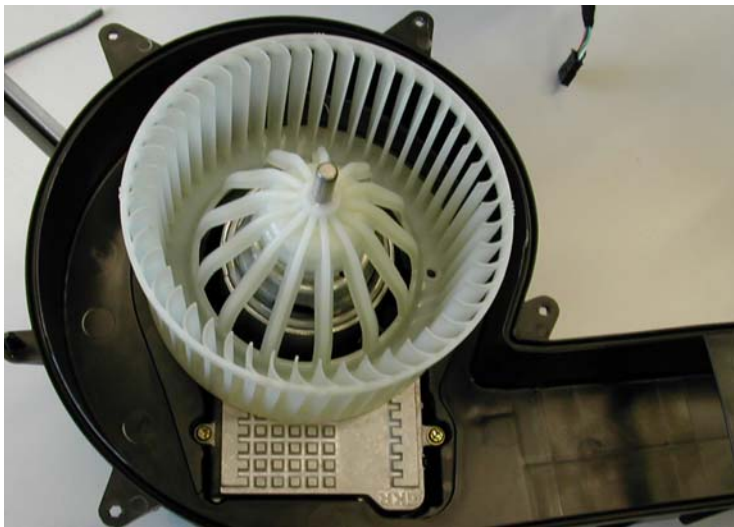
The rear compartment refrigerator box can be switched on or off both by means of a push-button on the cover of the refrigerator box. Function feedback takes place by means of a blue LED in the push-button. Operation of the rear compartment refrigerator box via the push-button is only possible, however, when both the left and the right control panel of the rear compartment air conditioning system are in OFF mode. The FKA is then operated at minimum blower stage and minimum temperature.

The rear compartment refrigerator box is always switched on automatically as soon as one of the two control panels assumes manual mode or when MAX AC is active. In this case, the push button has no function.

## Blower and Blower Control Module



1. Blower final stage
2. Blower
3. Recirculating Air Filter
4. Condensation water drain



### Blower and Blower Control Module

Blower and Blower Control Module shown removed from Rear Air Conditioning unit.

### Blower Volume control

Due to the separate control for the right and left, the blower output is corrected as a function of the following factors:

- Respective blower setting
- Maximum value of both blower settings
- Correction factor

In manual setting mode, the blower can be set directly by the blower adjuster between minimum and 75% of the maximum value.

Activation to 100% is only possible via the MAX AC function.

The potentiometer value of 0 - 100% is converted to the blower proportions on the basis of a characteristic curve (EEPROM values).

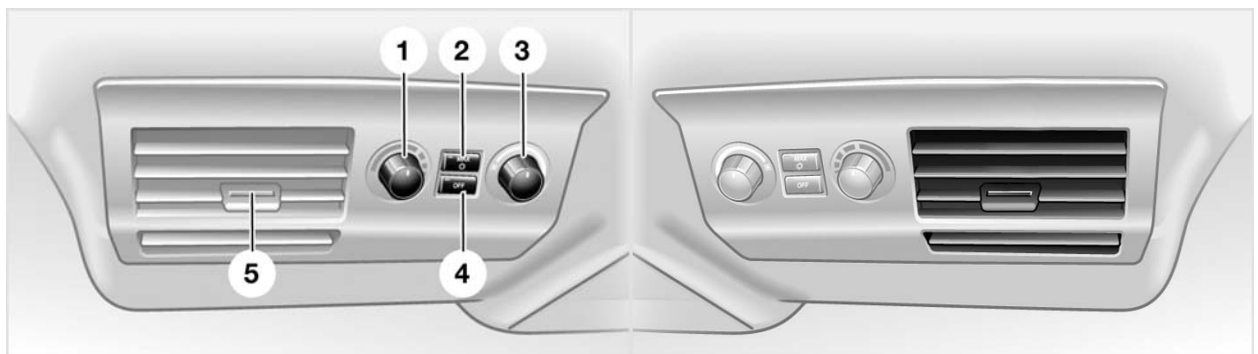
## Recirculating Air Filter

The demands made of the recirculating air filter correspond to the general quality specifications for particle filters (BMW QV 64 028). The service intervals that are defined in the maintenance manual also depend on these requirements.

## Evaporator Temperature Sensor

The resistance of the Evaporator Temperature Sensor should be approx. 9k Ohms. The working range is -10 °C...+40 °C and the substitute value is -10 °C.

## Control Panel with Electronics



**Left side Control Panel**

**Right side Control Panel**

1. Stratification Knob
2. Max AC cooling button
3. AC Blower control Knob
4. L/S OFF Button
5. Lever for air flow directional control

Control panels are provided on the left and right for individual control of the rear compartment air conditioning system. These control panels are also referred to as satellites. While the left-hand control panel only contains control and indicator elements, the right-hand control panel also contains the control electronics.

The push-buttons feature LEDs to indicate when the corresponding function is active. The following colors in the push-buttons indicate the active function:

- MAX AC Green
- OFF Orange
- Rear compartment refrigerator box ON Green

All buttons are equipped with a second LED to serve as a symbol and locator light.

All function LEDs are activated by the FKA control unit to ensure that the LEDs serve as a reliable feedback for the program status.

The function LEDs are powered via a voltage regulator to ensure their brightness does not vary in the event of voltage fluctuations.

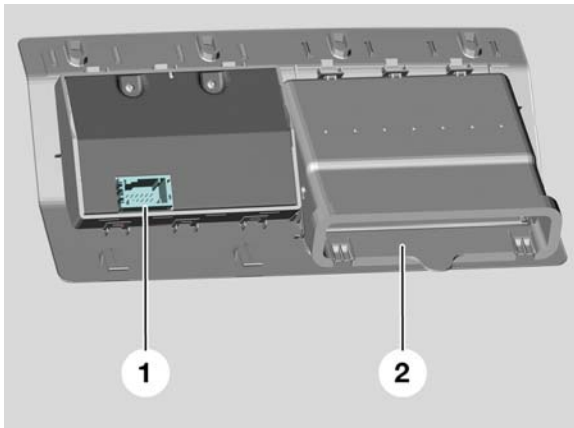
Since the push-buttons are not locked mechanically, their priority is defined by way of programming. The function lighting of the lower-ranking push-button is switched off for the purpose of indicating the priority to the customer.

The status of the rear compartment air conditioning system is additionally shown on the control display.



**Right Side Control Unit With Control Electronics**

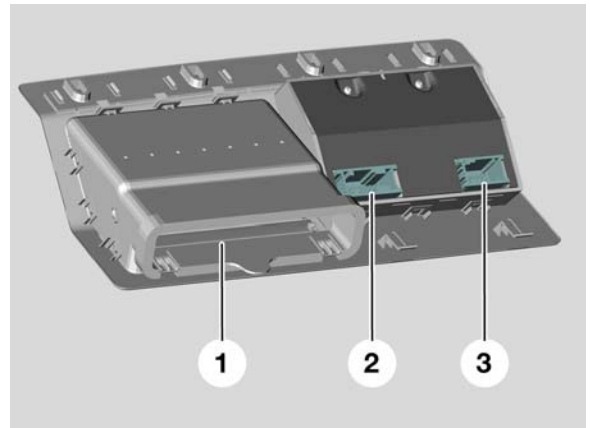
### Wiring Harness with Connectors



#### L/S Control Panel

1. 12 Pin Socket
2. Air Duct Connection

Pin Description	L/S 12 Pin Socket
1. B+ Supply Left	7. Not used
2. Temperature pot, l/s	8. Push-buttons, l/s
3. Blower pot, l/s	9. MAX AC LED, l/s
4. Locator light, PWM	10. OFF LED, l/s
5. VCC Monitor, l/s	11. Not used
6. Ground FKA, l/s	12. Monitor lighting, l/s



#### R/S Control Panel

1. Air Duct Connection
2. 18 Pin Socket
3. 12 Pin Socket

Pin Description	R/S 12 Pin Socket
1. B+ Supply Right	7. Not used
2. Temperature pot, r/s	8. Push-buttons, r/s
3. Blower pot, r/s	9. MAX AC LED, r/s
4. Locator light, PWM	10. OFF LED, r/s
5. VCC Monitor, r/s	11. Not used
6. Ground FKA, r/s	12. Monitor lighting, r/s

Pin Designation	18 Pin Socket R/S Control Unit
1. Terminal 30	10. CAN Bus High
2. MBus (MUX4)	11. CAN Bus Low
3. Terminal 31	12. Sensor Ground
4. Refrigerant shut-off valve, Front	13. Ground Stepper Motors
5. Refrigerant shut-off valve, Rear	14. Supply Voltage, Stepper Motors
6. Temperature Evaporator, Rear	15. Ground Stepper Motors
7. Not used except on Protection Vehicles	16. Refrigerator Box Function LED
8. Temperature Sensor, Left	17. Refrigerator Box Locator Light LED
9. Temperature Sensor, Right	18. Refrigerator Box Push-Button

### Calibration of left/right control panels

Manual operation of the rear compartment air conditioning system from two separate control panels takes place by means of push-buttons and rotary knobs, of which only those on the right are "intelligent." These two control panels must be matched with respect to each other; i.e. the right-hand control panel must be calibrated with the exact end stop values of the potentiometers of the left-hand control panel.

Updated Information

#### Start of calibration:

Start calibration by pressing all four push-buttons on both control panels simultaneously for at least 3 seconds. **Be sure the ignition is in the terminal R position.**

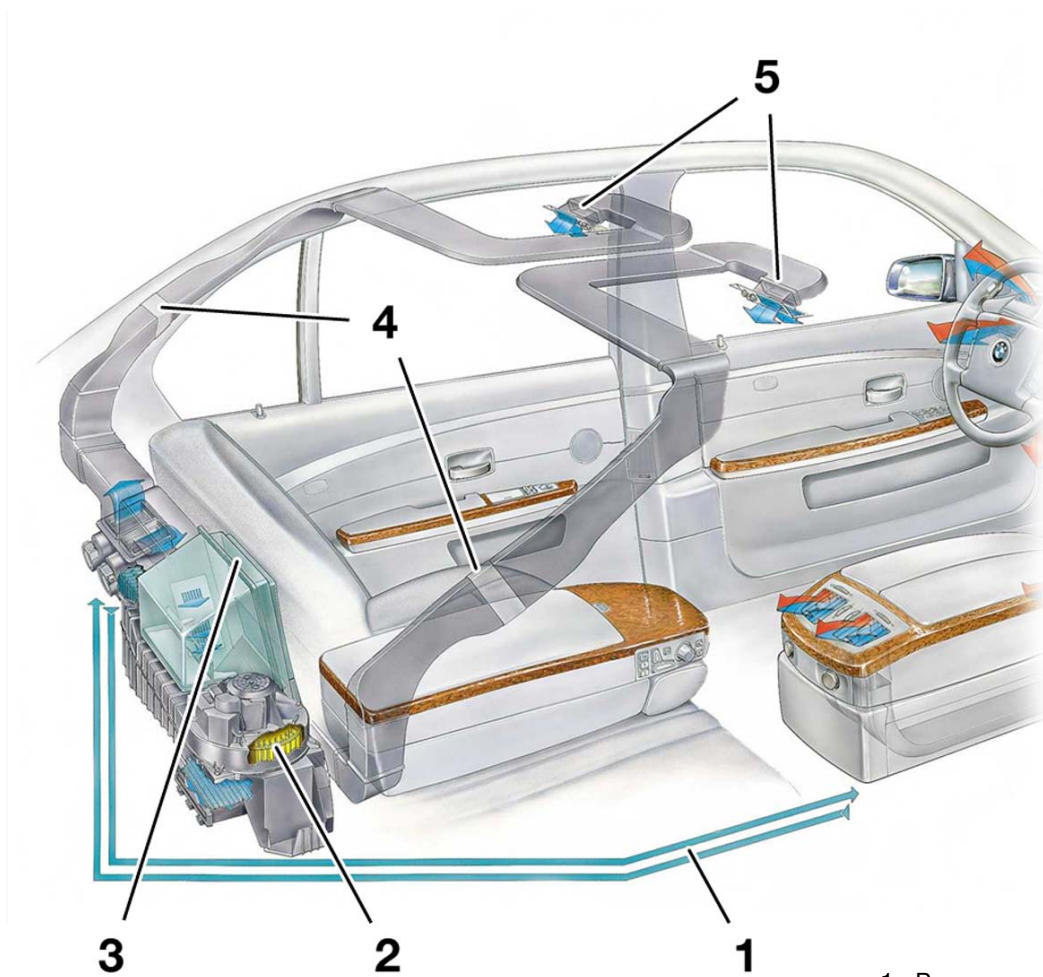
After starting the calibration procedure, the LEDs of the OFF button and MAX AC button on the left control panel flash.

- Turn both rotary knobs on the left-hand control panel to the left end stop (minimum values).
- Press the MAX AC button on the left-hand control panel. The MAX AC LED stops flashing as an indication for storage of the left end stops.
- Turn both rotary knobs on the left-hand control panel to the right end stop (maximum values).
- Press the OFF button on the left-hand control panel. The OFF LED stops flashing as an indication for storage of the right end stops.

The above procedure calibrates the left side potentiometers to the right side pots and control unit. The FKA control unit is "smart" and will only accept values (end stop positions) that are within specified limits. If the LED's continue to flash when the button is pushed, confirm that the dial is turned completely to the end stop.

## Rear Air Conditioning Duct Work

The rear compartment air conditioning system supplies the outlet grilles integrated in the headliner with temperature controlled air via ducts in the C-pillars.



1. Pressure and Suction Refrigerant Line.  
Note: Not in actual locations.
2. Blower and recirculated air filter.
3. Rear Compartment Refrigerator Box
4. Left/Right ducts to roof outlets.
5. Left/Right outlets in control units.

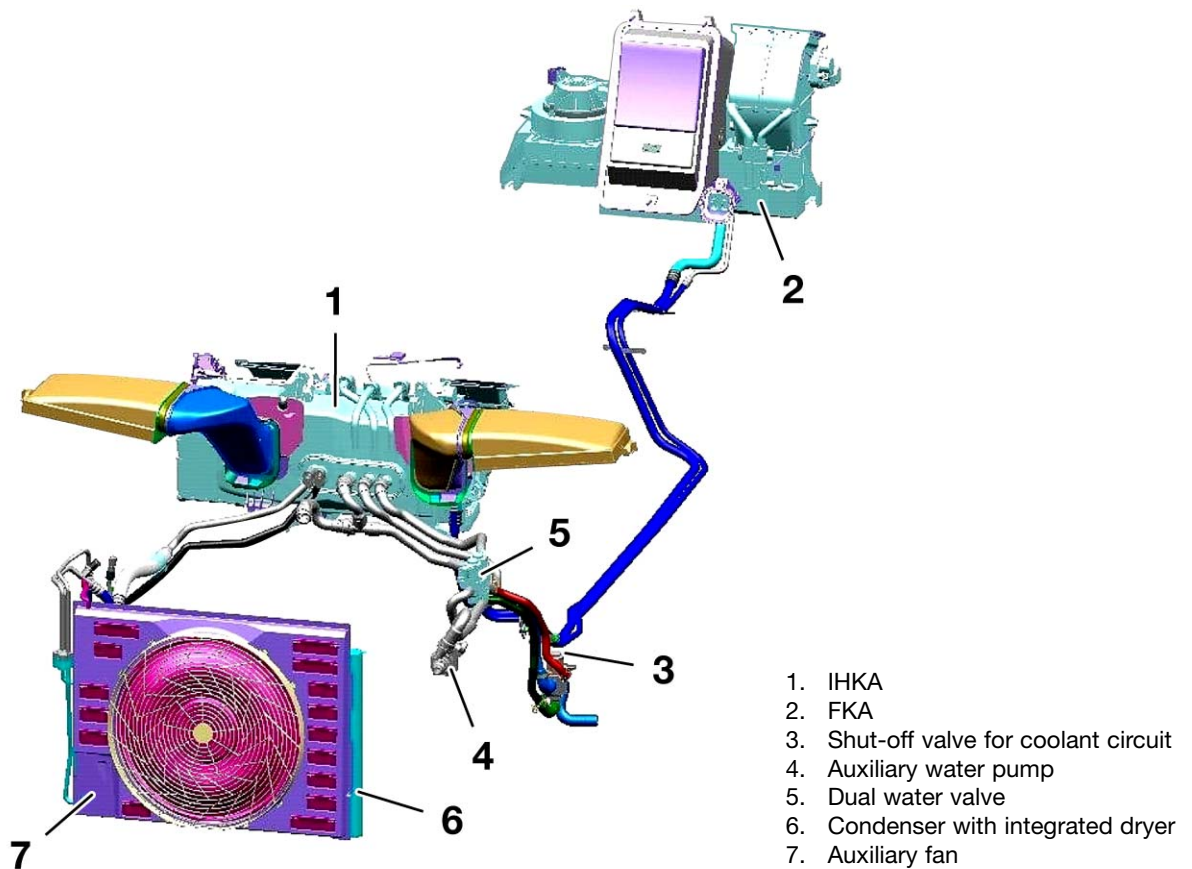




## System Operation

The rear compartment air conditioning system (FKA) is connected to the refrigerant circuit of the IHKA. The two circuits are isolated by means of two shut-off valves that are fitted only in connection with the rear compartment air conditioning system. The shut-off valves are fitted in the pressure line ahead of the respective expansion valves of IHKA and FKA.

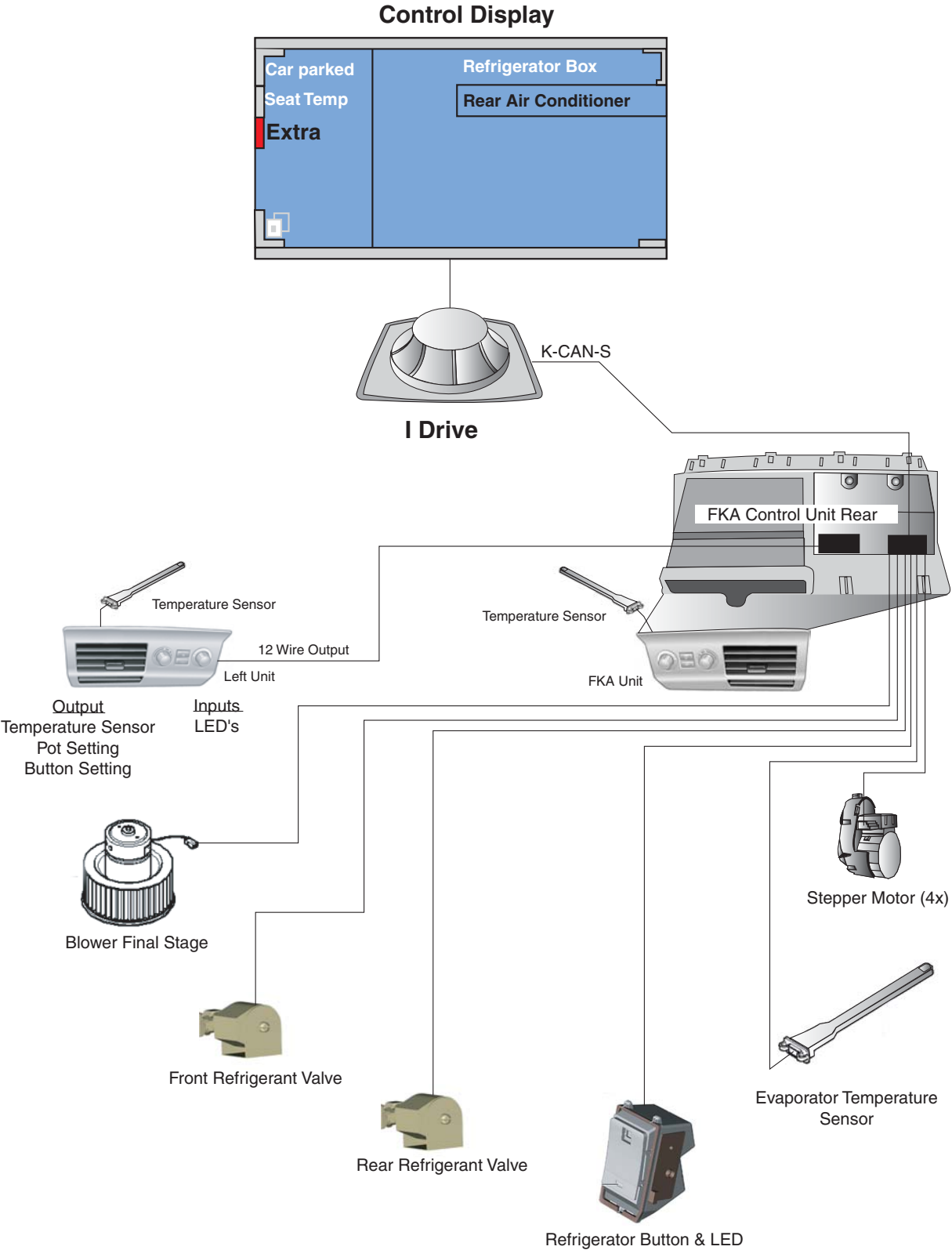
The rear compartment air conditioning system supplies the outlet grilles integrated in the headliner with temperature controlled air via ducts in the C-pillars.

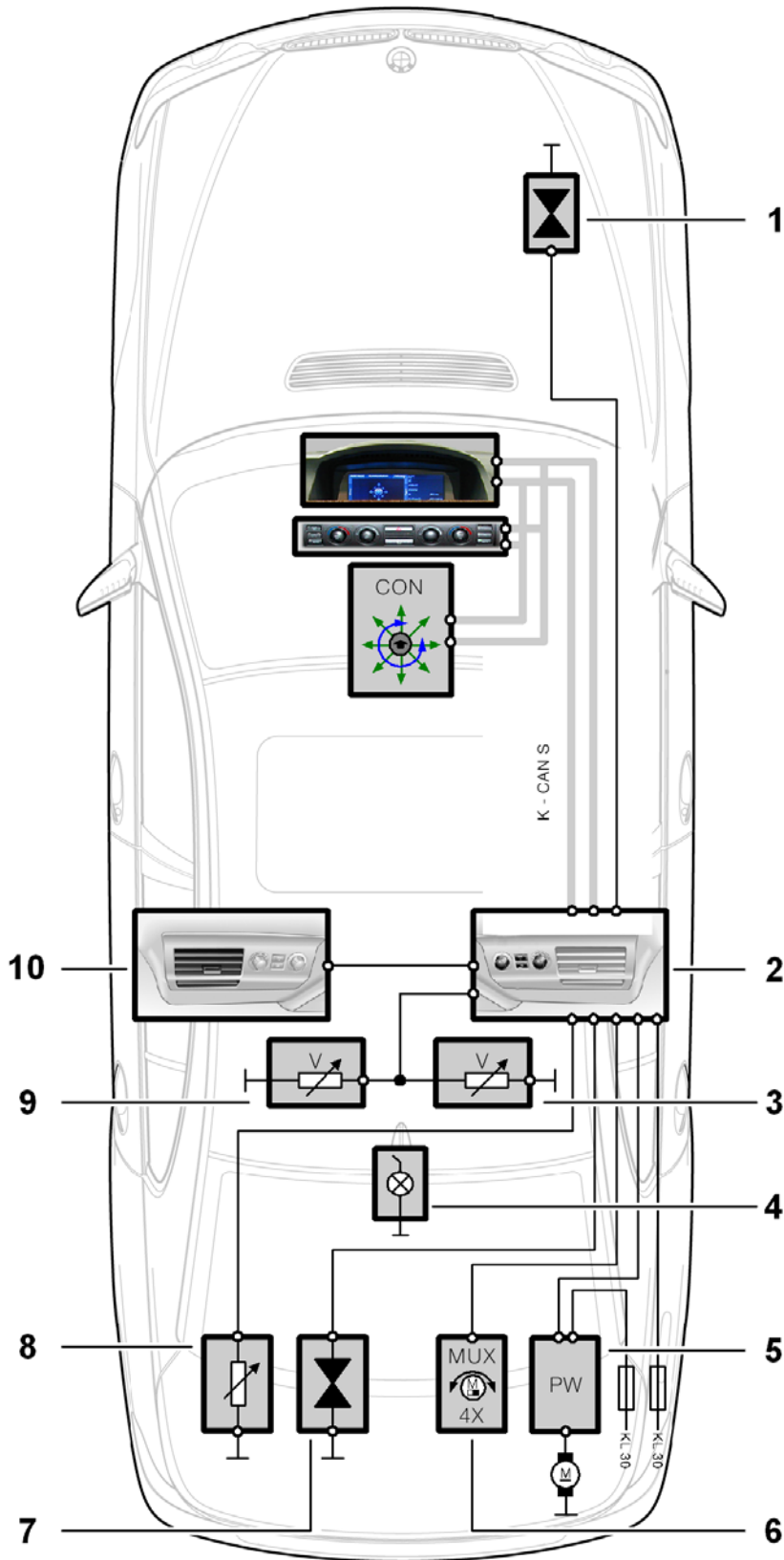


The rear compartment air conditioning system is operated by means of:

- Push-buttons and rotary knobs on the left/right control panels
- Push-button on the rear compartment refrigerator box (only refrigerator box ON/OFF)
- MAX AC function of the rear compartment air conditioning system
- Controller in control panel of front center console







1. Refrigerant shut-off valve, front, pressure line of IHKA.
2. R/S Control Unit
3. Temperature Sensor in Air Duct to R/S
4. Refrigerator Box
5. Blower with final stage output
6. MUX motors (4) for flap drives
7. Refrigerant shut-off valve, rear
8. Evaporator Temperature Sensor
9. Temperature Sensor in Air Duct to L/S
10. L/S Control Unit

## Control Unit Operating Matrix

Function	Location	Control	Function Feedback	Action
Temperature setting Left	Control panel Left	Rotary Knob	Marking on pot	Setting of temperature set point, Left
Temperature setting Right	Control Panel Right	Rotary Knob	Marking on pot	Setting of temperature set point, Right
Blower setting Left	Control panel Left	Rotary Knob	Marking on pot	Change of flap opening, Left and blower speed
Blower setting Right	Control Panel Right	Rotary Knob	Marking on pot	Change of flap opening, Right and blower speed
OFF Left	Control panel Left	Push-Button	Function LED Orange	Air supply for L/S off
OFF Right	Control Panel Right	Push-Button	Function LED Orange	Air supply for R/S off
OFF Left and Right	Control Panel Left and Right	Push-Button	Function LED's Orange	FKA OFF
MAX AC Left	Control panel Left	Push-Button	Function LED	MAX blower and stratification cold L/S
MAX AC Right	Control Panel Right	Push-Button	Function LED	MAX blower and stratification cold R/S
Refrigerator Box	Refrigerator Cover	Push-Button	Function LED	Depends on status of FKA

### Operation via IHKA

Communication between the IHKA and FKA control panels and with other control units takes place via the K-CAN bus.

Both control panels in the rear compartment assume MAX AC mode when the MAX AC function is switched on at the IHKA. When the MAX AC function is switched off again at the IHKA, the status before the MAX AC function was switched on is re-established on either side of the rear compartment air conditioning system. However, this only applies if no adjustments were made to the rear compartment air conditioning system during the MAX AC function.

The rear compartment air conditioning can then be operated normally.

### Operation via controller (I-Drive)

The control display communicates via the K-CAN SYSTEM with the rear compartment air conditioning and can influence its settings.

The following settings of the rear compartment air conditioning system are possible via the controller and are shown on the control display:

### Rear compartment air conditioning

The rear compartment air conditioning can be switched off via the controller or switched to MAX AC mode. A signal change is required for this purpose. When the signal changes from 0 to 1, both control panels are switched to MAX AC mode and both control panels are switched to OFF mode after a change from 1 to 0. The rear compartment air conditioning can be operated normally again after the changeover. The status of the rear compartment air conditioning system is sent back to the control display and indicated by a colour change in the displayed name.

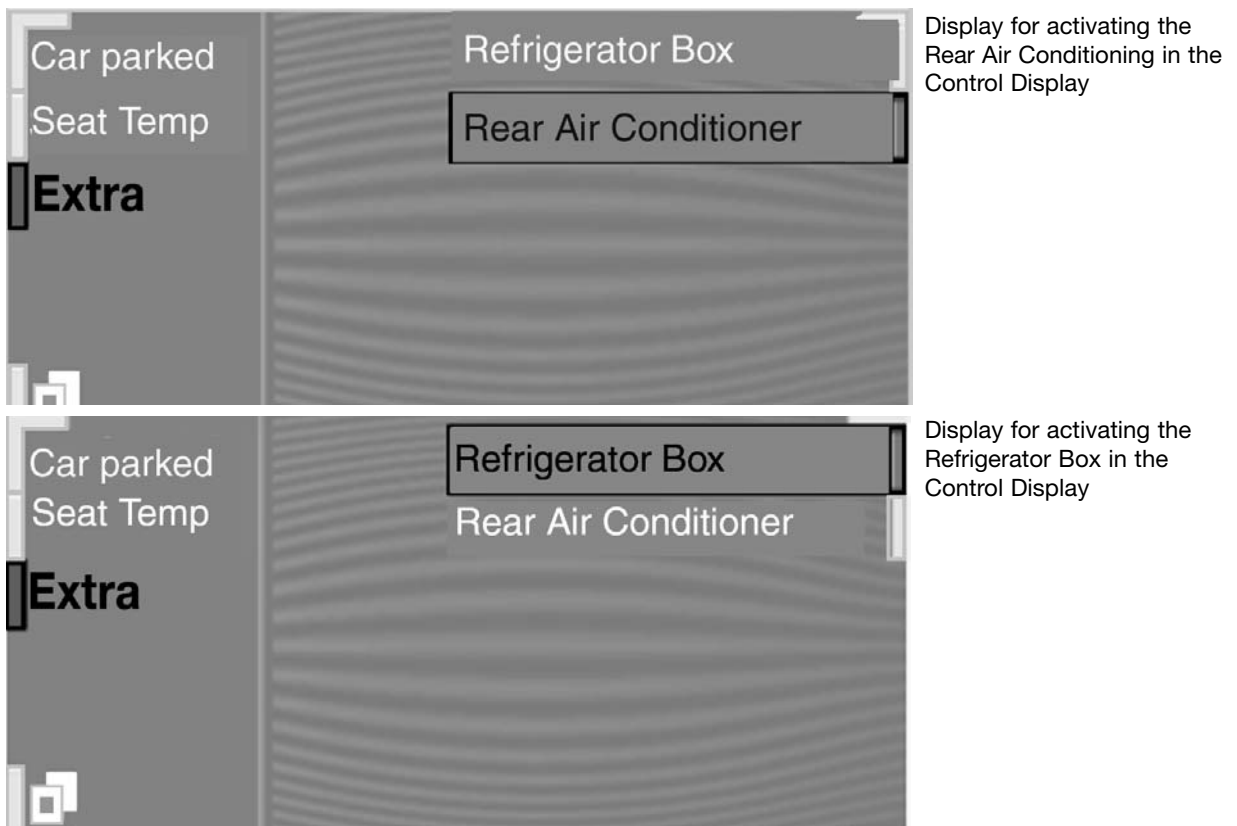
#### NOTE:

Signal = 0: Both control panels are switched off

Signal = 1: At least one control panel is switched on irrespective of whether in manual mode or in MAX AC mode.

Operation of the rear compartment air conditioning system can be locked out by the controller; i.e. the currently set functions of the rear compartment air conditioning system are "frozen" and operation is no longer possible. The lock-out status is sent back to the control display and indicated by a color change in the displayed name.

The remaining control functions of the controller of the IHKA are not affected by the lock-out of the rear compartment air conditioning.



## Operating philosophy

The rear compartment air conditioning system is not switched off when the OFF button on only one control panel (left or right) is pressed but rather only the air supply is interrupted by closing the ventilation flap on the respective side.

Rear Air Conditioning Left OFF	Rear Air Conditioning Right OFF	Status or Rear Air Conditioning
1	1	OFF
0	1	ON
1	0	ON
0	0	ON

OFF Button	MAX AC Button	FKA Before Mode			FKA Mode After		
		OFF	Manual	MAX AC	OFF	Manual	Max AC
1	0	0	0	1	1	0	0
1	0	0	1	0	1	0	0
1	0	1	0	X	0	0	1
1	0	1	X	0	0	1	0
0	1	0	1	0	0	0	1
0	1	1	0	0	0	0	1
0	1	0	0	1	0	1	0

X= status before OFF (MAX AC is deleted by load shut-down)

## Influence of rotary knobs on the OFF and MAX AC functions

- OFF active: Moving the temperature adjuster or the blower adjuster on one side by at least one notch activates the mode that was active prior to OFF.
- MAX AC active: Moving the temperature adjuster or the blower adjuster on one side by at least one notch activates manual mode of the respective side.

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## **Rear compartment refrigerator box function**

The rear compartment refrigerator box can be switched on or off both by means of a push-button on the cover of the refrigerator box as well as via a message in the control display (see "Operation via controller"). Function feedback takes place by means of a blue LED in the push-button. Operation of the rear compartment refrigerator box via the push-button is only possible, however, when both the left and the right control panel of the rear compartment air conditioning system are in OFF mode. The FKA is then operated at minimum blow-off stage and minimum temperature.

The rear compartment refrigerator box is always switched on automatically as soon as one of the two control panels assumes manual mode or when MAX AC is active. In this case, the push button has no function.

## **Transport mode**

This mode is activated/deactivated via standard diagnosis telegrams. When transport mode is activated, the rear compartment air conditioning system assumes OFF mode and remains in this state for as long as transport mode is active (operation is inhibited). After cancelling transport mode, the rear compartment air conditioning system remains in the OFF state, however, it can be operated again.

## **Service Information**

### **Filling mode**

Filling mode can be activated via the diagnosis interface for the rear compartment air conditioning system. In this mode, both shut-off valves (front/rear) are opened.

### **Diagnosis**

E65/E66 diagnosis consists of two different subjects:

- Self-diagnosis
- Fault code memory management

The first subject concerns the application tasks which independently carry out self-diagnosis on hardware components if possible and makes available the resulting information for the second subject (fault code memory management).

The data resulting from diagnosis represent the interface between these two components. While it is the responsibility of the application tasks to diagnose the faults, the resulting information is made available via fault code memory management to the tester.

In order to be able to distinguish better between these two subjects, in the following, self-diagnosis is still referred to as such while fault code memory management will be referred to as diagnosis.

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## Self-diagnosis

- All inputs and outputs can be activated in the diagnosis program.
- The control unit features a self-diagnosis cycle; fault location (fault code), type of fault, fault counter and ambient conditions are stored in the fault code memory.

Self-diagnosis is activated when terminal 15 is switched on provided the following diagnosis conditions are fulfilled:

- Engine speed = 0 or engine running signal from IKE (integrated body electronics)
- System voltage (terminal 30) within working range (11 V...15.5 V)
- No request for independent heating/independent ventilation

Self-diagnosis is active after a system transient recovery time of  $t > 4$  s.

During normal operation (up to deactivation of terminal 15), input diagnosis is conducted cyclically (at 4 second intervals). Only restricted diagnosis of the outputs is possible as the fault frequency is only checked based on the current operating status for various system outputs. If a fault is determined (sporadic fault), the corresponding DD-bit (diagnosis defect bit) is set in the RAM of the control unit and a corresponding fault code is entered in the fault code memory (static RAM) of the control unit.

Error messages are generated only if the conditions for diagnosis are fulfilled.

When a fault occurs, the faulty system input is replaced by the corresponding substitute value and system outputs are deactivated. The output must remain activated in certain cases for drivers for 2 outputs and a status line otherwise a fault will also be detected for the intact output.

The fault status of the system ports is redefined during the subsequent diagnosis cycle (repair attempt every 20 s). Generally in the case of fault, a maximum of 15 repair attempts are carried out. The output is then considered to be defective and is initially no longer switched in this operating cycle. Self diagnosis takes place again after terminal 15 has been switched off and on again and 15 repair attempts are implemented for each defective output.

The fault code entries are transferred from the fault code memory (static RAM) to the memory (EEPROM) within 3 seconds after switching off the ignition (terminal 15). Coding data are stored immediately.

The memory content is transferred to the fault code memory of the control unit after "Power ON Reset" (terminal 30). Here, the fault code entries (fault location and type of fault) are supplemented or updated corresponding to the current fault situation.

With the aid of the diagnosis tester, the fault code memory (static RAM) can be read out and its contents displayed. Only the diagnosis tester can delete the complete fault code memory.



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## Diagnosis with Tester

With the aid of standardized diagnosis commands it is possible to intervene via the diagnosis tester in control unit operation or control unit data and settings can be read out.

### Control unit operating data

With the aid of the following diagnosis commands, control unit operating data can be read out in predefined blocks and settings changed.

- Read analogue inputs. All analogue values are output that are read in via the analogue/digital converter of the micro controller.
- Read controller variables. Current values for the controlled variables and the air output are output.
- Read control panel settings. Current settings on the control panel are read out.
- Read digital ports. The signals currently applied at all PORT registers of the micro controller are output.
- Read flap positions. Current settings of the four air distribution flaps are output.

Set or delete diagnosis test bit. General diagnosis test mode is activated or deactivated for the FKA by setting the "diagnosis test" bit.

- Initiate calibration. The FKA adjusts the four flaps to defined positions.
- Control front or rear refrigerant valve  
The FKA opens or closes the front or rear refrigerant valve or sets "diagnosis defect" for this valve.
- Control blower  
The FKA sets the blower output as specified or sets "diagnosis defect" for the blower.
- Control left or right ventilation flap. The FKA sets the opening of the left or right ventilation flap as specified or sets "diagnosis defect" for this flap.
- Control left or right stratification flap.  
The FKA sets the opening of the left or right stratification flap as specified or sets "diagnosis defect" for this flap.
- Activate fill mode. Both refrigerant valves are activated simultaneously to facilitate filling or discharging the system with refrigerant.
- Read out boot software version. The current software version of the boot loader can be read out.
- Calibration of potentiometer for left or right satellite
- Calibration of the potentiometers for the left or right satellites is started.

### Control unit identification data

With the aid of diagnosis commands, control unit identification data and logistics data can be read out in predefined blocks and entered in the memory (EEPROM) of the rear compartment air conditioning system.

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## Vehicle identification number

This identification option is used to enter the vehicle identification number in the FKA memory (EEPROM). Since the vehicle identification number is a part of the UIF entries (UIF = User Info Field) a check must be conducted here as to what UIF is currently applicable.

## Fault code memory

The fault code memory can contain a maximum of 6 fault codes determined by the control unit during vehicle operation together with 8 ambient conditions such as setpoints, inside/outside temperatures and terminal status.

The first data byte contains the number of fault codes. This is followed by a detailed description of the first defined fault code with:

- Fault code
- Type of fault
- Frequency counter
- Eight ambient conditions providing information on the respective status of the control unit when the fault occurred

Following this fault code description, up to 5 further fault codes can be stored in the same way.

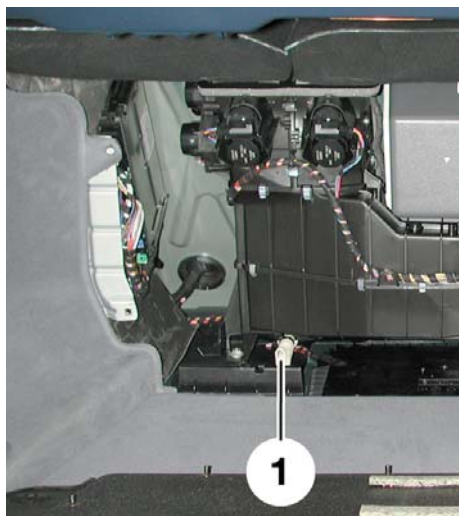
## Control unit status data, defaults

The current control panel settings and other important status data are written to the FKA memory (EEPROM) shortly before the control unit assumes sleep mode (30 s after terminal R OFF).

To save the control panel settings, the data are additionally stored after the last change to the control panel settings:

- Every 10 seconds with the engine running
- Every second with the engine stationary

## Condensation Water Drain



The Condensation Water Drain below the evaporator is designed to ensure the condensation water is drained off reliably even with the vehicle in extreme positions.

Particular care must be taken during assembly to ensure that the condensation water drain is fitted correctly.

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## Review Questions

1. Once programmed may one of the stepper motors (MUX4) be moved to another stepper motor position? \_\_\_\_\_  
Why? \_\_\_\_\_
2. Why is the FKA fitted with two (2) electric shut off valves? \_\_\_\_\_  
Where are they located? \_\_\_\_\_
3. At what times is the Refrigerant Box switched on? \_\_\_\_\_
4. What is the location of the FKA blower final stage? \_\_\_\_\_
5. Where is the Recirculating air filter for the FKA located and what must be done to replace it? \_\_\_\_\_
6. Which FKA control satellites contains the control electronic for FKA operation? \_\_\_\_\_
7. How are the left and right control satellites calibrated? \_\_\_\_\_
8. How does the FKA communicate with the IHKA and other control units in the car? \_\_\_\_\_
9. Is the temperature setting of the FKA controllable through the I-Drive? \_\_\_\_\_
10. How does the transport mode affect FKA operation? \_\_\_\_\_
11. What special procedures need to be performed to check or adjust refrigerant levels in cars equipped with FKA? \_\_\_\_\_
12. Does the FKA system operate in a heat mode? \_\_\_\_\_